

How Design and Technology can be Used to Meet the Needs of Pupils with Autism at Key Stage 2 – the Challenges and Potential

Abstract

This article explores how certain aspects of design and technology can aid some of the special educational needs of pupils with autism and the positive contribution it makes to their educational experience. It examines the problems that may be experienced in providing the appropriate access for such pupils at Key Stage 2 and identifies some approaches to these issues.

Design and technology as part of the curriculum for all pupils

The development of design and technology as an integral part of general education is one of the most notable curriculum developments in recent years. It is now seen throughout the world as significant and many countries are trying to incorporate technology in the education of all children. From the Education Reform Act 1988, the National Curriculum emerged, which offered a broad and balanced education for all pupils providing progression and continuity from 5 to 16 and beyond. This was the first attempt ever to teach design and technology to all children throughout the 11 years of compulsory schooling.

The Warnock Report (1978) recognised the rights of children with special educational needs:

Whereas for some (children) the road they have to travel towards the goals is smooth and easy, for others it is fraught with obstacles. For some the obstacles are so daunting that even with the greatest possible help, they will not get very far. Nevertheless, for them too, progress will be possible and their educational needs fulfilled as they gradually overcome one obstacle after another on the way. (DES, 1978)

However, both the 1988 Education Reform Act and the subsequent Education Act 1996 stated that all maintained schools must follow the 10 *subjects, various programmes of study* (which set out what pupils should be taught) and *attainment targets* (these set out the knowledge, skills and understanding which pupils of different abilities and maturities are expected to have at the end of each key stage) irrespective of the extent or degree of disability.

The principle that all pupils should with SEN (special educational needs) share a common entitlement to a broad and balanced curriculum with their peers. (NCC, 1989: 1)

For the first time as a result of the review of the National Curriculum 2000, a section on

inclusion is a focus and explains how teachers can:

modify, as necessary, the National Curriculum programmes of study to provide all pupils with relevant and appropriately challenging work at each key stage. It sets out three principles that are essential to developing a more inclusive curriculum:

- A Setting suitable learning challenges
- B Responding to pupils' diverse learning needs
- C Overcoming potential barriers to learning and assessment for individuals and groups of pupils. (DfEE, 1999: 30)

In the design and technology National Curriculum Order and the Key Stage 3 scheme of work, guidance is given to teachers on modifying the programmes of study. One of the main aims of the review of the National Curriculum was to ensure stability in schools and to raise standards. The changes were made to allow schools to develop their curriculum in ways to best meet the needs of their pupil population. The programmes of study were designed to be less prescriptive and to provide greater curriculum flexibility. Design and technology (2000) has strands at Key Stage 2 which are:

- developing, planning and communicating ideas
- working with tools, equipment, materials and components to make quality products
- evaluating processes and products.
- knowledge and understanding of materials and components. (QCA 1999: 6)

The major concern for teachers must be to retain good practice whilst participating to the fullest extent in the National Curriculum. With ingenuity the National Curriculum can be used as '...an agent of progress rather than as a limitation of effective development...' (Ouvry, 1991: 48)

As teachers, we need to be aware of the differences between learners and must take these differences into account when teaching. Everyone should have access to learning in design and technology, however, to provide equal opportunities we must provide for different learning styles since relying on one 'typical' style would penalise some and favour others. There must, however, be a balance between respecting individual differences and ensuring children develop technological capability. As individuals we all respond to certain conditions and situations in certain

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ways. It is therefore important to now look at the way in which design and technology can be matched to the characteristics of autistic disorders.

Characteristics that pupils with autism display in design and technology

The original definition of autism was given by Leo Kanner (1943) who recognised a group of children who displayed many shared features. In the 1970s, Lorna Wing, with her colleague Judith Gould, studied all children under the age of 15 with any kind of learning, physical or abnormality of behaviour in the London Borough of Camberwell. Wing and Gould found a cluster of common features within their group that experienced developmental difficulties that provided a diagnostic criteria for autism. It is these common features which are referred to as the Triad of Impairments in Autism (Wing, 1988). The 'triad of impairment' can be summed up as (see box below).

For a diagnosis of autism to be justified then all of these behaviours should be out of keeping with the child's mental age. (Jordan and Powell, 1998: 2)

These observations have led to the view that autism should be conceived of as a continuum. Although all children with autism share these areas of impairment, there is no common way to meet their educational needs in design and technology. Some will have severe impairments in each of the areas of the triad whilst others at the high end of the continuum may display markedly odd behaviours and yet are able to learn in a mainstream design and technology classroom with little additional assistance.

An example of this would be our project on Joseph's Coat where children had to design and make a coat of many colours for Joseph. Initially the story of Joseph was read to the class. At this point the children with autism

were listening but could not understand why they had to listen to this in a design and technology lesson. They would also not understand why they were making a small version of a coat and so their lesson included a model, which was named Joseph, and they had to make him a multi-coloured coat. They did not take into account anyone else's ideas but enjoyed the different techniques for dyeing material. Individual books with the coloured material and how it was achieved were made and then at the end of the lesson, the children with autism could choose from their book which dyeing technique they wished to use.

The contribution of design and technology to the education of pupils with autism

At the beginning of the Programme of Study for design and technology in Key Stage 2 it sets out a rationale for what will be experienced at Key Stage 2.

Pupils work on their own and as part of a team on a range of designing and making activities. They think about what products are used for and the needs of the people who use them. They plan what has to be done and identify what works well and what could be improved in their own and other people's designs. They draw on knowledge and understanding from other areas of the curriculum and use computers in a range of ways. (DfEE, 1999: 94)

On initial reading it would appear that design and technology presents considerable challenges to children with autism as it seems to exacerbate all of the difficulties these children can experience. However I have found that children with autism do participate (Craig and Ian [not real names] do not put their screens up during these lessons) and learn from design and technology. Sights or sounds often distract children with autism,

Social

Impaired, deviant and extremely delayed social development – especially interpersonal development.

This causes problems within design and technology where children have to work as part of a team. Some children with autism find it difficult to respond to social interactions and may appear aloof or will get some social interactions wrong which alienates them from the group.

Language and communication

Impaired and deviant language and communication – verbal and non-verbal.

This causes problems within design and technology where children have to develop ideas and explain them clearly plus communicate design ideas.

Thought and behaviour

Rigidity of thought and behaviour and impoverished imagination.

This element is the one which impacts the most on design and technology as children with autism find it difficult as they are unable to think of others and will find it difficult to generate ideas for products for others.

making it difficult for them to identify or attend to relevant cues. Blocking out as many sights and sounds as possible can help them focus on a particular activity. Design and technology can offer unique opportunities as it provides children with a concrete lever, which allows them to develop their ideas in a way that is unique to them. An example of this is where a child may be asked to design and make a shoe for royalty. For a child with autism this brief is too broad, but if asked to design a shoe for a party to fit their foot they can make the shoe from paper and pins and keep referring to their own foot to make the pattern.

Using visual memory

Powell and Jordan (1997) suggest that there are four interconnected features of autistic thinking in the way:

1. information is perceived
2. in which the world is experienced
3. in which information is coded
4. the role of emotion as a context in which those processes may or may not operate. (p. 4)

One of the strengths of design and technology is that it has its roots in the visual rather than verbal memory. Children with autism have great difficulties with communication and so do their best work when tasks are presented to them visually. Children with autism are easily overwhelmed by sensory input, lacking the ability to control or organise information effectively. By visually organising materials in either containers or by easy referenced pictures/photographs, we are providing instructions in the way that is easiest for them to understand. Children with autism have a good memory for personal events that are stored in the context of their occurrence and so it is best to group items that are to be remembered (see Appendix I for pictures used to remind children what they need at the start of the lesson. This will later be changed to words to provide more flexibility in thinking). At the start of the lesson the children were marking and cutting wood to make a chassis with triangular card corners for strength. Craig would have sat and waited for the other children/adults to tell him what he needed. In previous lessons he had been shown exactly what each picture represented and where the materials/tools were kept. By this stage Craig could be given the pictures and so was able to assemble all the equipment he needed unaided.

This allows for some independence selecting tools for making their product (2a design and technology Key Stage 2). Once familiar with

this procedure the children will be encouraged to be involved in the choice of materials for the task and their attention will be drawn as to the reason for that choice i.e. 'I need saw,' said Craig. 'Why do you need the saw Craig?' asked his support assistant. 'Cut wood,' replied Craig.

The school's scheme of work is adapted to meet the needs of individual pupils and contains a mixture of strands from both Key Stage 1 and 2. This was suggested as a good policy by Curriculum Guidance Two: A Curriculum for All:

... it is suggested that some pupils will need specially designed schemes of work which provide access to Level 1 in foundation subjects or which break down the elements of Programmes of Study into a series of finely graded, age appropriate, achievable steps. (NCC, 1989: 8)

Looking at some of the schemes within the Programmes of Study I will attempt to show how, with a little imagination, they can be accessed by children with autism.

Engaging in a design and make assignment

We may well think that children with autism cannot resolve a design problem, however, they will if the situation is of immediate relevance to themselves. Take the child whose favourite item has been placed on a high shelf until later. First the child may well pull up a box to reach it, then a chair, a table and eventually a chair on the table until eventually they are able to climb up and reach it. Within this analogy the child has analysed the problem, developed a system, constructed a solution, evaluated it, reconsidered it and tried again. From this it is clear that when thinking of design and make assignments, the teacher must try to make them relevant to the child.

All design and make assignments should be based in reality and be related to visible concrete objects. With Christmas approaching and the season of parties upon us, it is easy to design and make sandwiches for a party the children will be attending. Some children with autism are very sensitive to certain textures or flavours or they may dislike anything with lumps, plus their inflexibility often applies to food, especially trying anything new. The assignment started with the children drawing what they liked to eat. We then looked at the type of bread Craig ate and asked parents what type of spread was used at home. The container was shown to Craig so that he knew it was the same as the one at home and so was willing to try some of the new breads providing they used the known spread. The class then tried different spreads using Craig's

bread. Craig tried all the different white breads but not the brown ones. Again, when looking at fillings we started from Craig's filling but added things we knew he would tolerate. The other children tried many other combinations but Craig was quite limited in his choice. Eventually all the children prepared the sandwiches chosen for the party and everyone ate sandwiches at the party, including Craig.

In the *Developing ideas* strand it suggests pupils should generate ideas for a product, thinking about who will use it. As children with autism experience the world in a unique way (Powell and Jordan, 1997) and may have a range of experiences that are both restricted and selective, it is difficult for them to perceive others having a problem. Their thinking tends to be very literal and they have problems using imagination or dealing with hypothetical circumstances. This can be overcome by making the problem a personal one for them. Instead of asking them to design a sandwich for a party, have them taste their own usual sandwich and carefully introduce an additional topping. Care has to be taken with regard to obsessional fears or dislikes. Try a different topping each day and make an immediate record with a smiley or sad face. At the end of the week the child can see which topping/s they preferred and then design a sandwich for the party. I appreciate it is not always easy to encourage children with autism to try new food but it can be one way of extending their experiences. The rooting of design and technology in everyday life is especially important for children with autism. The contexts are more meaningful than situations where they have no experience at all, and they are far more likely to apply the knowledge they have accrued if it has been learnt in the context to which it must be applied. This particular activity also has valuable domestic and independence skills. Within this topic children are taught food hygiene and one aspect of this is to wash hands before handling food. The children will eventually wash hands without being asked but may have no understanding of the principle involved and it can then just become a ritual. The child should be encouraged to look for dirt by smelling, feeling or thinking about the previous activity. The aim is to increase the child's understanding of the purpose of hygiene and develop a more flexible strategy for deciding whether it is appropriate or not to wash their hands.

Planning requires direct teaching

The children have to plan what to do. Doing often presents few problems but planning needs direct teaching. Ian came into a different class who were sewing. He was

given the outline of a glove puppet and shown how to sew. Initially he did not understand but once red dots had been placed where the needle had to go, and he was shown how to use the needle he was content to sew on his own. His stitching was neat and he never once displayed any of his usual ritualistic behaviours. Planning can be achieved by drawing or taking a picture of what the child has done. Then the child could be encouraged to sequence the pictures and this will then show their plan. This also presents an opportunity for teaching some social skills. As the aim of the investigation is to produce a sandwich for a party the child must have the sequence extended so that they understand that others will be eating the sandwiches they have made. If this social cue is not taught it could lead to problems at the party, when having made the sandwiches, the pupils may not want to 'share' them, nor are they interested in others sandwiches. The last thing we want them to do is withdraw from the social contact.

Communicating their ideas using a variety of methods could be seen as a problem as the autistic condition causes some language difficulties, however many children with autism have specific language problems. One way to overcome this could be to use the computer. When designing and making an adventure playground take out the digital camera when visiting playgrounds and let children take pictures of equipment available. Also take photographs of children using the equipment. The child with autism can then be encouraged to use a draw package to make initial drawings of their piece of equipment. Using digital photographs will help to remind them of the need perhaps for safety or how the mechanism works. However, Ian has fine motor problems that make using a normal keyboard difficult. A way to overcome this problem would be to have an overlay keyboard with pictures that could then be sequenced. There could be some blank boxes so that some flexibility of response could be built in order to prevent a passive form of learning.

Other useful communication strategies involve using less language. It is thought that the average sentence length for some children with autism should be five to ten words long. Another strategy would be to incorporate long pauses between sentences/words. Tools which are used should be named several times whilst the child is handling them to ensure understanding.

Many teachers find strand 2, *Working with tools, equipment, materials and components to make quality products*, the easiest to teach,

as basically it is practical skills building. There can, however, be problems with this due to obsessional fears or transference of learnt skills. We are presently following the guidelines (First draft sent to special schools for testing therefore not yet published) produced by the Lancashire design and technology Advisors. One of the first skills they suggest be taught is tearing paper, which later builds into cutting skills. The children all enjoyed this activity for a few days until we had a letter of protest from a mother whose child is autistic saying that he had transferred this particular skill to home and was trying to tear off the wall paper! This will be thought out over the next few weeks as no immediate solution has been formed and yet we do not want the experience to be forfeited, as it is a precursor to cutting skills.

Measure; mark out, cut and shape a range of should be straightforward, but again to ensure safe access for pupils with autism there are precautions we should take. As stated earlier Ian has problems with fine motor skills and as yet is unable to use a pair of scissors unaided. At present he uses scissors which have two sets of finger holes so that an adult can guide him. However, if the adult becomes distracted Ian will immediately cut his own hair. Dwelling on the dangers of scissors could excite Ian as he has little concept of what it means to cut his own hair. We have found it is better to teach Ian what to do rather than what not to do and so Ian has a cut out of his own hands and is instructed, each time the assistant has to help someone else, to put his hands on his picture. On the whole this works well as it does stop some of his obsessional twirling (twirling is a reward). Children with autism tend to flap their hands, collect shiny objects, and spin themselves or articles (these are only a very few repetitive behaviours) because they enjoy the sensation but also it keeps them feeling calm and safe.

Transferring learning form one subject to another

When dealing with measuring it is an assumption that as the class has covered measuring lines in maths that it will automatically be transferred across to design and technology. However, children with autism need to have skills encoded within a personal dimension or else like all rote learning it will be dependent on cues for recall. So although a child with autism may have learnt how to measure a piece of paper using a ruler in the morning and 'know' that skill, they cannot use the knowledge in the afternoon to measure a piece of wood. The child will need to be appropriately cued by 'Remember you measured the paper in maths

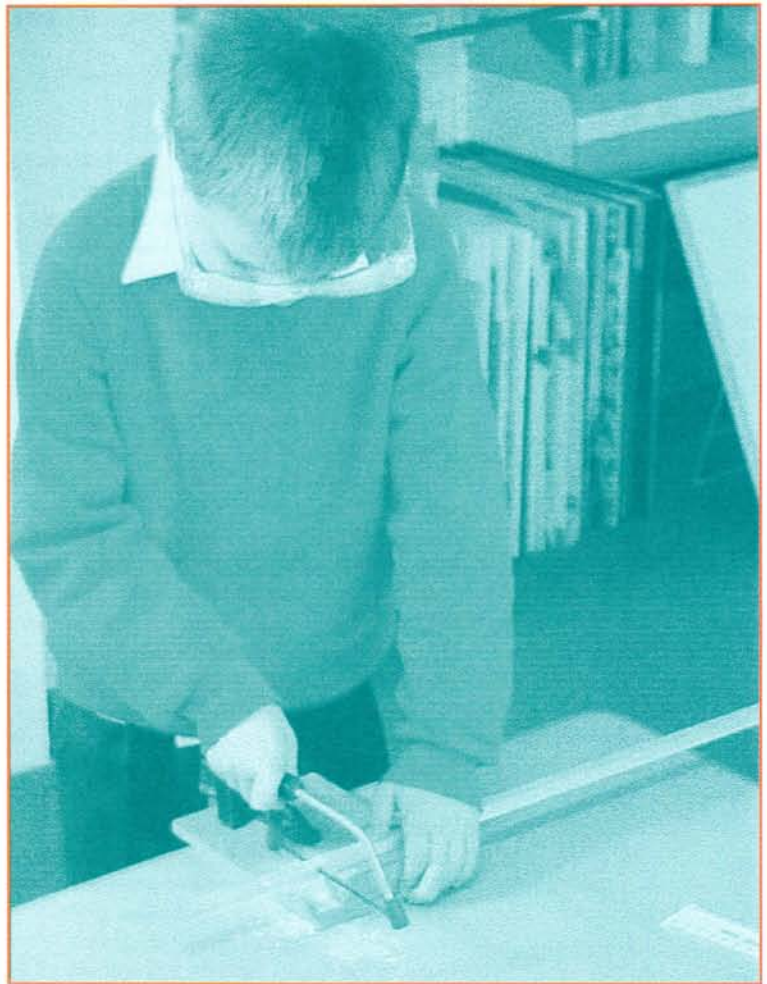


Figure 1.

this morning.' They then may recall the event effectively and measure the wood. It may then be useful when in the maths lesson a variety of objects are measured ensuring the wood they are using in the afternoon is among them. Once they have mastered the measuring they can then go onto cutting with the saw (See Figure 1 for a photograph of Ian cutting wood independently after measuring it).

Evaluating processes and products

The final strand in design and technology that I will look at is possibly the most difficult for children with autism to access, *Evaluating, processes and products*. Difficulties arise through the impairment of rigidity of thought and behaviour where there appears to be a lack of imagination of children with autism. This can cause further problems in design and technology where the children are expected to decide if the product meets its intended purpose. For this to occur it requires an individual to extrapolate from one set of circumstances to another, possibly in a different context. Children with autism often lack a sense of 'self' and awareness of others. Because of this difficulty in establishing a sense of self, children with autism will find it

difficult to reflect on their actions or products and take them into new directions. Communication, a key difficulty in autism, and suggesting the use of computers, diagrams, models and pictures may be a way around the problem. However, an emphasis on communicating with others is essential. Working together in an activity helps ensure a joint reference between adult and child (reinforcing interpersonal development). In the puppet topic, Craig was encouraged to play with the puppets with an adult. They looked at how the puppet was made, what each puppet could do and what it could say. This helped develop social timing and turn taking at the same time as providing an opportunity to discuss ideas and look at ways to improve his own puppet. Initially the puppet outline was stapled together, but Craig was not keen on this as the holes between staples were too big and allowed his fingers to go through. He could not initially think of an alternative way of joining the material together and so he was led to try gluing. Craig liked this as it was quick and he could not get his fingers through. He wanted to leave the puppet as he thought this was the best technique. His puppet was then 'accidentally' dropped and stood on resulting in it being washed. Craig washed it and found the glue came apart in the water and so another means of joining was required. We looked at his clothes and found that most were sewn together and finally he tried this method which worked. Craig could not evaluate on his own but could be encouraged, sometimes by devious means, to evaluate and come up with improvements!

In conclusion I feel that the introduction of design and technology in the National Curriculum was essential as children with autism benefit from a curriculum which incorporates a problem-solving approach in which independent learning is encouraged. It is possible that children with autism can learn thinking skills within the framework of the National Curriculum. For the foreseeable future design and technology will be a legal requirement for all schools and it is important that children with autism are included in this process as the difficulties they already experience lead to some degree of isolation from their peers: '...education should aim to lessen rather than increase that isolation.' (AHTACA, 1990: 35)

As can be seen the content of the design and technology Programmes of Study is both relevant and mostly accessible. With imagination problems of access can be overcome and so design and technology should play an important part in the education of all children. Success in introducing design

and technology depends a great deal upon teachers' attitudes. Through their relationships with their pupils, through skilful intervention and thought, children with autism can develop their technological capability. Technology is all around us and we must learn to see it, use it and allow pupils to deal with it in their own ways, sometimes with support.

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Appendix I

